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HARTFORD EXPERIENCE WITH COMPOUND METERS¹

By J. E. GARRATT²

Experience with compound meters in Hartford so far has been confined to testing and trying out the various makes, with the idea of seeing which are best suited for the various needs to which they must be put. For meters over 2 inches in size compound meters are used almost exclusively, that one being selected which best suits the particular installation. As old installations come to the attention of the department through trouble or regular inspection tests, new compound meters are put in their place or, if possible, compounding valves are purchased with by-pass meters. Names of compound meters appear on the Hartford meter record cards which would startle many of the meter manufacturers.

There is a wide difference between the various makes of compound meters. Each meter maker has his own, of course. One may have the largest capacity of any of a given size but may also have the greatest weight to be handled and require the largest space for setting. Another may require a straight run of pipe on the inlet end in order that it may register properly, and so, although in certain places it may be an excellent meter, yet in other places it may be of no value. A third may be light, compact, well made and easily handled by one man yet of such small capacity that it defeats one of the principal reasons-for-being of a compound meter. Two others may be of about equal capacity and dependability, while one is much heavier to handle yet takes up much less space than the other and one may be dismembered and entered through a small opening through which the other may not pass. So there are many things which are considered in selecting compound meters in Hartford.

The most serious of these considerations is the requirement of a straight entrance run of pipe of the same size as the meter without valves or other disturbing elements. Several makes of compound

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² Office Engineer, Board of Water Commissioners, Hartford, Conn.

meters are in no way affected by this consideration but in one or two it affects the registration very seriously. Tests made in this connection of one particular meter gave the results recorded in table 1.

There seems to be the most effect on the registration with 1-foot and 3-foot lengths of straight inlet, while a 2-foot length gives less effect than the 3-foot. Also, the 4.5-foot inlet gives the least effect but even this length does not appear to be sufficient to completely overcome the large effects caused when the elbow on the inlet is turned to the left.

TABLE 1
Percentage registration of 3-inch compound meter with different lengths of straight inlet pipe

METHOD OF LEADING FLOW INTO STRAIGHT INLET	RATE OF FLOW	LENGTH OF STRAIGHT INLET			
		1 foot	2 feet	3 feet	4.5 feet
Straight.....	A	98.2	102.5	100.2	99.7
	B	97.9	101.5	99.5	100.0
Through elbow turned up.....	A	98.2	99.3	104.6	99.3
	B	98.2	99.3	104.0	98.9
Through elbow turned to left.....	A	105.6	101.0	104.0	102.1
	B	104.0	98.3	104.1	102.2
Through elbow turned to right.....	A	97.2	102.2	100.3	99.2
	B	98.0	102.1	100.0	98.5
Through elbow turned down.....	A	105.2	101.7	100.5	98.8
	B	104.6	102.1	99.9	98.6

NOTE: A = Rate of flow of about 35 cubic feet per minute; B = Rate of flow of about 20 cubic feet per minute.

To show the effect of a partly closed valve on the inlet side of this meter the tests recorded in table 2 were made, using 2 feet of straight 3-inch inlet, 3-inch valve, short 3-inch nipple, 3-inch coupling reduced to $2\frac{1}{2}$ -inch and a $2\frac{1}{2}$ -inch hose. The half-closed valve seems to affect results only slightly while the three-quarters closed valve affects results considerably, as might be expected.

There seems to be a point, at that rate of flow where the weighted check valve in the compound meter begins to open, at which the percentage registration of some meters is low. This point varies in different makes of meters. At this same point the loss in pressure

through certain meters mounts very quickly to as much as 10, 15 or even 20 pounds, while beyond this point the pressure loss may again drop to less or continue practically the same until very large flows begin to pass through.

The condition may arise where a compound meter of large size is needed to supply certain uses which come only seldom but where the bulk of the water is used in the region of this disturbed flow through the meter at which rate of flow the registration is low. If such is the case, one make of compound meter whose point of change from small to large meter is not the same as the expected rate of use might be better than another.

TABLE 2
Effect of partly closed valve on inlet side of a 3-inch compound meter

VALVE POSITION	FLOW, CUBIC FEET PER MINUTE	PERCENT- AGE REGISTRA- TION	VALVE POSITION	FLOW, CUBIC FEET PER MINUTE	PERCENT- AGE REGISTRA- TION
Wide open.....	38	99.6	Half closed	35	100.7
Wide open.....	29	100.8	Half closed	26	101.3
Wide open.....	25	101.3	Three-quarters closed	30	103.0
Wide open.....	17	100.5	Three-quarters closed	18	102.2

An interesting experience was had while installing a compound meter to supply a high building on the top floor of which was a restaurant. The architect of the building persisted in his demand for a large meter, exaggerated his requirements, and the department could do nothing else than install a 3-inch compound meter. It was of a type whose pressure loss quickly mounts to about 10 pounds at a rate of about 1.5 cubic feet per minute and then quickly drops back to about 2.5 pounds and from that gradually increases again, with big flows reaching a loss of 10 pounds again at a rate of about 20 cubic feet per minute. Under actual operating conditions water was used in the restaurant at rates close to 1.5 cubic feet per minute at which rates the pressure loss in the meter was about 10 pounds. It so happened that at certain times during the day, previous to the installation of a new 42-inch supply line to the city, there was just about pressure enough to force water to the top of this building and at these times the 10 pounds lost in the compound meter was a serious consideration from the point of view of that kitchen water supply. Had the department installed a 2-inch disc

meter, which was its idea of the building's true need, the loss of pressure at the rate of 1.5 cubic feet per minute would have been less than 1 pound.

At least one type of compound meter has adjustable weights on the compounding valve so that it can be made to open at any desired rate of flow. Previous to the Hartford department's appreciation of this feature it installed such a compounding valve on a 4-inch line supplying a power station. The previous meter had been subjected to very severe treatment. Within the year after the compound meter was put on this line, the disc of the small bypass meter was broken and replaced three times. After the third break the trouble was brought to the attention of the author. Investigation showed that the small meter had passed 600,000 cubic feet of water and the large 4-inch meter slightly less than this. No time was lost in finding the remedy for this and in removing some of the weight on the compounding valve.

The one point strongly brought out by the sellers of compound meters is the great reduction in the amount of water which passes the meter without being registered. Hartford as yet has not been able to get any figures on this phase of the matter. The compound meters have been principally new installations. The few meters which the department has compounded itself have been on factories and power stations where the use of water is very erratic and variable. From a study of the amount of water used before and after compounding one could not say that there was a definite increase in the amount of water accounted for by the meter. In Hartford, a yearly test of all large meters is made in place, on small flows as well as on large flows, so that they are kept in very good shape.

In selecting compound meters which the department will purchase the following points are considered:

1. Loss of pressure at various rates, low as well as high.
2. Accuracy of registration with special regard to the accuracy at the point where the flow begins to pass through the large meter.
3. Effect of entrance disturbances on the accuracy of registration.

In selecting from the several kinds which are purchased the particular meter for any installation the following points are considered:

1. Loss of pressure at rates expected on the installation.
2. Rate at which compound valve begins to open with relation to possible uses at that point.
3. Weight in connection with meter setting.
4. Space occupied if available space for setting meter is small.